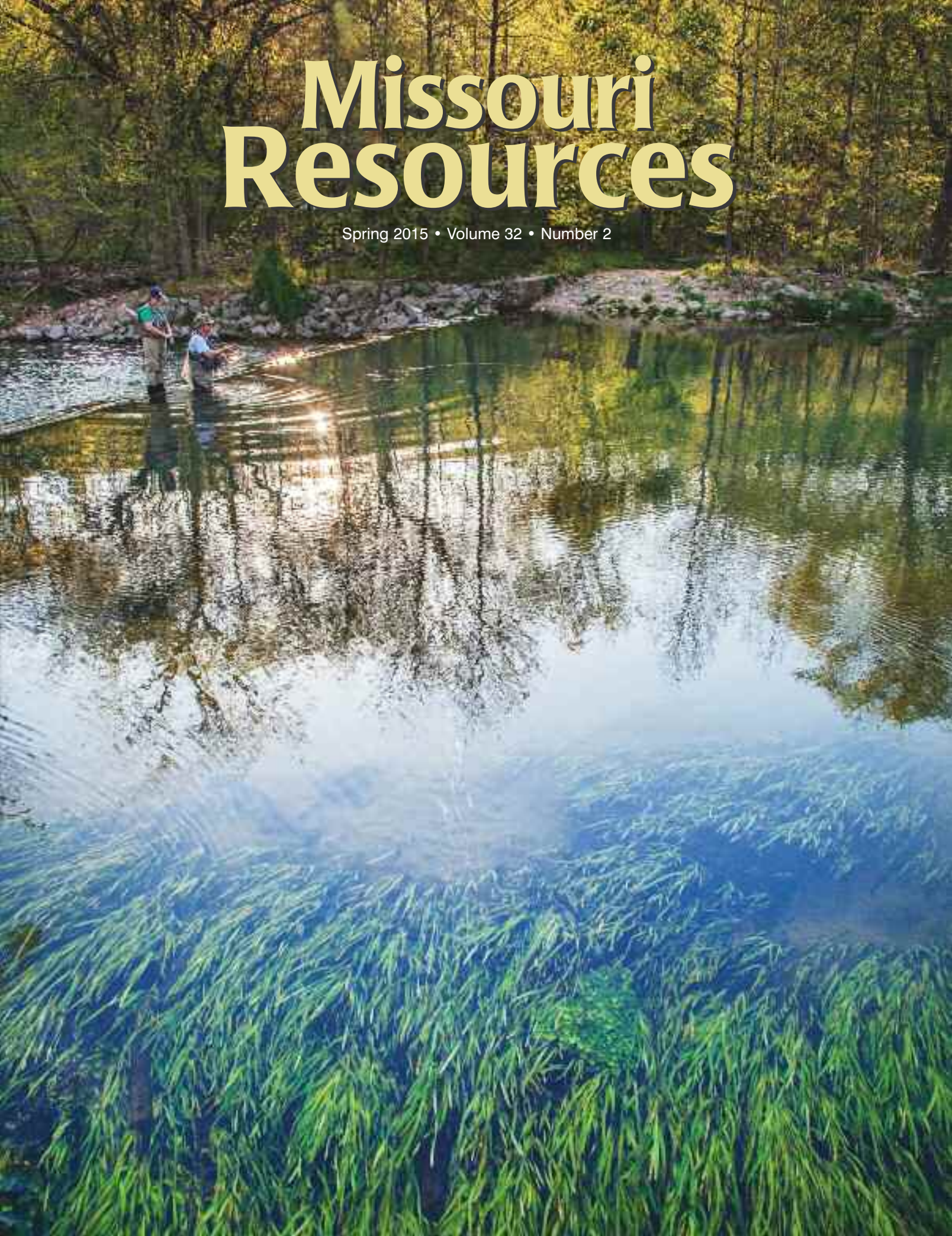


Missouri Resources

Spring 2015 • Volume 32 • Number 2



director's comment

Theodore Roosevelt once said “Far and away the best prize that life has to offer is the chance to work hard at work worth doing.”

I believe we can all agree that protecting our air, land and water quality is certainly work worth doing, which is why the Missouri Department of Natural Resources has been working hard the last 40 years to fulfill this mission.

Our health and quality of life are closely tied to the health and quality of our natural resources. We depend on good quality water for drinking. We want to be surrounded by clean and healthy air, lands, rivers and lakes when we spend quality time in Missouri's great outdoors.

March 1 marks the opening of trout season – a tradition of welcoming spring by casting a line in one of Missouri's cold-water streams. The spring-fed, pristine water flowing through each of Missouri's three majestic state trout parks provides the essential ingredient required for trout to thrive and anglers to enjoy.

Anglers may wet their lines at Roaring River State Park near Cassville, Bennett Spring State Park near Lebanon or Montauk State Park near Salem. Missouri's trout fishing season began March 1 and runs through Oct. 31.

Our state's outstanding water resources play a critical and valuable role in providing our families, friends and visitors with the ability to enjoy numerous outdoor recreational opportunities. To ensure our waters are protected, Missouri revised its water quality standards to extend Clean Water Act protections to more than 115,000 miles of streams and rivers and 3,080 lakes and reservoirs. This is an increase of more than four times the number of Missouri waters previously protected.

In this issue of Missouri Resources, you can learn how water makes our Missouri State Parks even “More Per-



fect,” and how the “Healthy Water” helps support Missouri's vibrant economy and improves the quality of life for all of us.

Each of us shares a common goal of protecting our water resources – because, they belong to all of us. That's why it's important for everyone to play a part ... to understand and protect our waters ... to ensure a positive future. It's hard work but we certainly believe it's work worth doing!

Sara Parker Pauley
Missouri Department of Natural Resources

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Mission Statement

The mission of the Missouri Department of Natural Resources is to protect our air, land and water; to preserve our unique natural and historic places; and to provide recreational and learning opportunities for everyone.

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Would you like to visit a place where everyone can indulge their curiosity about geological, environmental and earth science?

Learning really *can* be fun!

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Above: Long Branch State Park in Macon County offers ample opportunities for water recreation. *DNR photo by Ben Nickelson.*

Front Cover: The pristine waters of the Current River make Montauk State Park a memorable place to enjoy trout fishing.

DNR photo by Ben Nickelson.

Back Cover: 2014 Katy Trail Ride cyclists make their way from Hermann to Jefferson City on day two. *DNR photo by Mackenzie Manning.*

MORE PERFECT



by Bill Bryan
Director, Missouri State Parks

I love the outdoors, but I'm first and foremost a fly fisherman. Water is integral to our state parks system. Naturally, as an angler, one of my favorite quotes from Norman Maclean's timeless novella, *A River Runs Through It*, provides a good starting point when one ponders what water means to our state parks. Maclean wrote:

“When I was young, a teacher had forbidden me to say “more perfect” because she said if a thing is perfect it can’t be more so.”

Nothing is perfect. As Maclean alluded, although something may not be perfect, it can always be “more perfect.” Meaning, it can be made closer to being perfect.

That's precisely what water does for our state park system. The park estate is made more perfect by water. As an element of state parks, water

shapes the landscape in many ways, makes it more pleasing to the eye and provides unmatched opportunities for outdoor fun.



DNR photo by Tom Uhlenbrock

(Opposite page) Guests learn the fundamentals of kayaking at Current River State Park. DNR photo by Ben Nickelson

(Above) At Dillard Mill State Historic Site, visitors can learn about water powered gristmills, used to grind grain.



Waterscaping the State Parks

The impact water has on the landscape is evident all around us. However, in a few state parks, visitors can more than scratch the surface by exploring an underground world made possible by water. There are nearly 190 caves in Missouri state parks. Water has played a principle role in forming every one of them. Looking at rock from the inside out, we get a better picture of how

water has shaped our earth.

At Onondaga Cave State Park, visitors can see firsthand how water shapes cave ecosystems. The cave is a National Natural Landmark because of unique features like the famous Lily Pad Room. In addition to spectacular attractions, naturalists interpret the cave's flora and fauna to round out a visitor's tour with a fuller understanding of the importance of clean and abundant water.

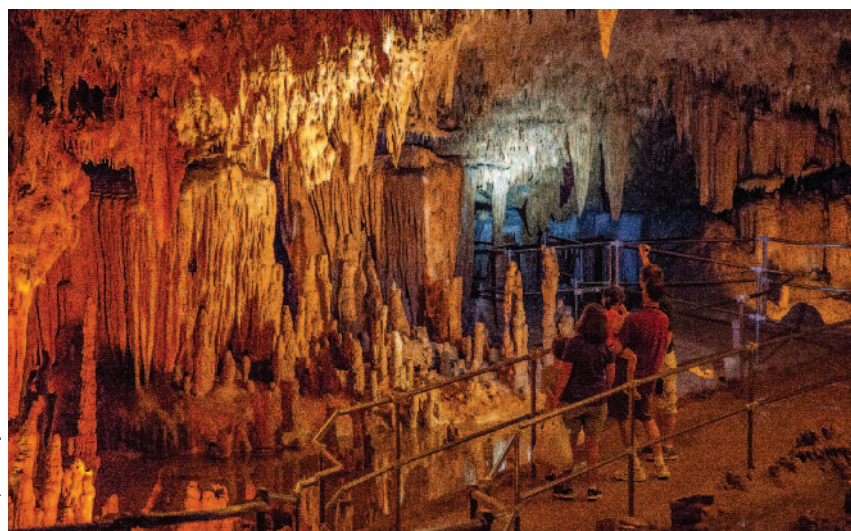
For a more adventurous experience, visitors to Ozark Caverns at Lake of the Ozarks State Park take a guided hike with handheld lanterns. Ozark Caverns includes a very rare feature called Angel's Shower, where an amazing shower of water flows from the ceiling. Angel's Shower is the only feature like it in the world that is accessible to the public. One can be mesmerized and confounded by water flowing through rock to create this geologic masterpiece.

The many rock bridges and collapsed caves in state parks also tell a fascinating story about the power of water. The erosive force and collapse potential is evident at several parks including Rock Bridge Memorial, Grand Gulf and Ha Ha Tonka state parks.

And water that flows underground eventually reaches the surface at places like Ha

(Above) Bennett Spring State Park is one of three state parks where visitors can enjoy trout fishing. DNR photo by Scott Myers

(Below) Visitors can take a guided cave tour at Onondaga State Park.



DNR photo by Ben Nickelson

Ha Tonka, Montauk, Bennett Spring and Roaring River state parks. When it gushes from a spring, water not only shapes the landscape, it transfixes the eye.

Water is for Recreation

According to the American Recreation Coalition, more than 70 percent of outdoor recreation in America takes place on or along a waterway. While reservoirs were built for flood control or water supply, recreation is what rules at state parks on the shores of major impoundments around the state.

State parks can be found at Table Rock, Long Branch, Mark Twain, Pomme de Terre, Stockton, Harry S Truman and Wappapello lakes and reservoirs. These state parks offer great camping, hiking, fishing and other water sports. Whether you'd rather paddle a kayak trail at Stockton, rent a pontoon at Pomme, or try something more adventurous like flyboarding at Table Rock, our state parks offer water recreation that is right for you and your family.

DNR file photo



More Perfect State Parks

Our award-winning state park system is made more perfect by water. In 2015, we will redouble our efforts to make sure our guests enjoy interesting programs about the role water plays in the landscape, work even more tirelessly to protect the special places accented by water, and provide outstanding opportunities for recreation in, on and around the water.

Again, in the timeless words of Norman Maclean, "... in the end, all things merge into one, and a river runs through it."

Rivers, lakes and streams run through and help connect our magnificent state parks and historic sites to comprise one of the nation's very best state park systems.

To learn more, visit mostateparks.com, and remember, you are always welcome in Missouri State Parks. 🐾



(Above) Table Rock State Park offers numerous water recreation activities.

(Below) Long Branch State Park features trails with scenic views of the lake.



DNR photo by Ben Nickelson

Drug Drop Box Rx for Cleaner Water

by Larry Archer



Officer Tara Ammel of the St. Louis County Police Department details the use of a P2D2 drop box at the North County Precinct Office.

DNR photo by Ben Nickelson



“The biggest concern with flushing them down the toilet is that those pharmaceuticals do not get pulled out when they go through the water treatment plant. So basically, whatever gets flushed down that toilet goes straight into the rivers.”

– Ken Tomlin, Sourcewater Protection Coordinator,
DNR Water Protection Program.

Generally, getting more than a ton of drugs off the streets requires law enforcement agencies to conduct months – or years – of undercover work in the field. In St. Louis County, drugs of this quantity are carried through the door on an annual basis.

That’s because the St. Louis County Police Department, along with several municipal police departments in the county, are partners in Missouri Prescription Pill and Drug Disposal (P2D2), a program aimed at promoting the proper disposal of unused prescription medicines.

Prescription medicines, when no longer needed and left in bathroom cabinets, present the potential for abuse, especially by youth, said Capt. Tim Tanner, St. Louis County Police Department.

“We believe, and I think pretty much it’s been shown, there is potential for abuse of these medications if they’re left lying around and there is no outlet to really get rid of these things,” said Tanner. “You see that with teenagers typically, and we hear about that quite often. These are the types of drugs (prescription medicines) that they will take advantage of and abuse if they are

readily available to them.”

The same drugs, when disposed of improperly – especially by flushing them down the toilet or rinsing them down the sink – threaten water quality. This dual threat prompted action in St. Louis County, said Ann Detmer, external affairs manager for Missouri American Water.

“There were some articles in the media about the fact that prescription drugs had been detected in the nation’s rivers, and there were a lot of questions about what communities are doing about this,” Detmer said.

In St. Louis County, the solution came in the form of drop boxes in local police stations. The first boxes were located in select St. Louis County Police Department precinct offices, and later in other municipal police stations.

Ten such boxes are now in service in St. Louis County, according to Detmer.

Protecting human health, aquatic life and water quality are benefits of the Missouri Prescription Pill and Drug Disposal Program.

DNR photo by Andrew Richmond

“Oddly enough, the idea that you have a box in a police station to drop these off came from a guy named Paul Ritter, and he is a high school teacher in Pontiac, Ill.,” she said. “We went to him because it seemed like that program had the most promise, even though it was being implemented in a small town.

“Over time we worked out all the issues and we became the largest program of its type in the nation,” Detmer added. “It was a long process to make sure that we did it right and that we managed it in such a way that we could offer this service, and do it in a way that was responsible.”



Flushing old prescription drugs down the toilet is no longer recommended because it harms water quality and aquatic life.

DNR photo by Ben Nickelson

“We believe, and I think pretty much it’s been shown, that there is potential for abuse of these medications if they’re left lying around and there is no outlet to really get rid of these things.”

– Capt. Tim Tanner, St. Louis County Police Department

Operating since 2012, Missouri P2D2 has annually averaged roughly 14,000 pounds of unneeded prescription drugs – drugs that might otherwise have ended up on the streets or in our rivers.

The Missouri Department of Natural Resources provided the group with a sourcewater protection grant to pay for the collection boxes and promotional materials, according to Ken Tomlin, who serves as the sourcewater protection coordinator for the department’s Water Protection Program.

At one time, flushing or rinsing medications down the toilet or sink was recommended. As these drugs have now been discovered in rivers and streams, the prevailing advice has shifted to drop-off sites, drug drop-off events or secured disposal, according to Tomlin (see sidebar on page 9).

“The biggest concern with flushing down the toilet is that those pharmaceuticals do not get pulled out when they go through the water treatment plant,”

(Right) Sgt. Jim Heldmann with the Ballwin Police Department says their P2D2 box sees frequent use, especially on weekends. It often requires emptying three to four times a week.



DNR photo by Ben Nickelson

How To Safely Dispose of Prescription Drugs

While locations such as St. Louis County and Columbia have year-round prescription drug drop-off sites, many communities rely on scheduled special events for the collection of unused prescription drugs.

When collection sites or events are not locally available, the Department of Natural Resources

offers direction for disposing of prescription drugs through its agency fact sheet, "Management of Household Pharmaceutical Waste, Sharps and Thermometers."

The best way to manage such waste is to minimize it in the first place by taking prescription medications as directed; using all of the medication until it is gone (unless directed otherwise by your doctor); and only purchasing and using essential pharmaceuticals.

If there are remaining unused and unneeded prescription drugs, the fact sheet makes the following recommendations for disposal of prescription pills:

- Remove from the original container and put the contents into a hard plastic container such as a laundry detergent bottle. Remember to mark out personal information on the prescription bottles before placing in the trash.
- Add a small amount of water to dissolve the medicine.
- Add a thickening material such as cat litter, flour, salt, charcoal or coffee grounds. Nontoxic powdered spice such as turmeric or mustard may be added to discourage wildlife or young children from trying to eat the resulting material.
- Seal the container and place it in the trash just prior to pick-up.

The complete fact sheet, which is available on the department's website at dnr.mo.gov/pubs/pub2252.htm, also offers similar recommendations for liquid medications and medications in blister packages.

he said. "So basically, whatever gets flushed down that toilet goes straight into the rivers."

Flushed pharmaceuticals also can harm the beneficial bacteria that are responsible for breaking down waste in the septic system or wastewater treatment plant, reducing the effectiveness of the treatment.

"While the effect of pharmaceutical pollution on humans is unknown, it has had an impact on aquatic life," Tomlin said.

"The problem with that is whatever different critters you have out there in the river react differently to these things," he said. "I think there are some studies that show pretty strongly that there have been impacts to fish, including fish sterilization."

In Columbia, the Safe Prescription Disposal Initiative has combined the drop box concept – located at the Columbia Police Department main office – with biannual drop-off events in communities throughout the county, said Becky Markt, director of the Youth Community Coalition, one of the initiative partners. Markt explained that although they serve a smaller population than St. Louis County, the Boone County effort has been well received.

"They've collected nearly a ton here locally and in the surrounding communities," she said. "That's a lot of little pills." 🐾

Larry Archer is division information officer for the department's Division of Environmental Quality.



Late May to early June is the best time to visit Prairie State Park to view newborn bison calves.

DNR photo by Steph Deidrick





Spring Brings “Bison Babies” at Prairie State Park

by Megan Hopkins

American bison are the largest land animals in North America, and one of the few places in Missouri where guests can watch these fascinating creatures roam the prairie is at Prairie State Park near Mindenmines in western Barton County. Starting in May, a rare opportunity is present as calving season begins and pumpkin-colored calves appear alongside their mothers.

“People like babies, no matter what kind, and bison babies are just like other babies – they are just cute,” said Brian Miller, natural resource steward with Missouri State Parks.

Spring at Prairie State Park

Guests wanting to catch a glimpse of baby bison should plan a visit to Prairie State Park in late May or early June. Getting a chance to spot the calves during that time is especially fun for guests as the calves are not only adorable but entertaining to watch.

“They are a pumpkin color, kind of a reddish-orange, when they are first born. They run and bounce around, and they are just happy,” said Miller.

A Rare Ecosystem

More than 13 million acres of tallgrass prairie once covered over one-third of Missouri's landscape. Today, less than 65,000 acres remain. Prairie State Park is Missouri's largest remaining tallgrass prairie landscape. Purchased with the help of The Nature Conservancy, Prairie State Park preserves a rare and disappearing diversity of life.

The park's diversity is represented by more than 150 birds, 25 mammals, 25 reptiles, 12 amphibians and approximately 500 species of plants, 350 being native prairie species. Specific animals, including the southern prairie skink and several insects, are not found anywhere else in the state. The reintroduced herd of more than 25 elk graze the western portions of the park.

To preserve this heritage, park staff conduct research, monitoring and stewardship practices. Prescribed fires remove accumulated grass mats and increase soil nutrients. The open character of the prairie is protected with the removal of invading trees. Bison and elk have been reintroduced to join other native grazers to maintain the natural grazing processes. Where the prairie vegetation no longer exists, native plants are sown.

The orange fur serves an important purpose, allowing bison calves to blend in with the prairie grasses. When spotted, their mothers are usually not far.

The calves grow quickly, and begin grazing within days of birth. By the time a calf is a year old, it can weigh as much as 400 pounds, is developing its hump and slowly becoming darker in color.

The presence of bison at Prairie State Park started in 1982 when nine bison were brought to the park. Today, the herd is maintained at about 100 head.

Bison Hikes Offered Each Month

According to Miller, the best opportunity to see young bison is on one of the monthly guided bison hikes.

The guided hikes include information about the bison and the prairie ecosystem, as well as

Bison calves grow quickly and begin to darken in color during their second year.

DNR photo by Tom Uhlenbrock





instruction on how to best safely observe the bison. The hikes are also a great time to see wildflowers blooming in the park, especially in the month of June.

Hikers should be prepared for a two-mile hike over uneven terrain. Bringing water, snacks, insect repellent, a hat and sunscreen, and wearing sturdy shoes is recommended. Binoculars are useful in looking at bison and other wildlife that inhabit the prairie. Participants should dress for the weather as prairie winds can be strong.

Generally, the hikes are held on the first Saturday of each month, but visit mostateparks.com/events or contact Prairie State Park at 417-843-6711 to find out the specific dates and times of the bison hikes.

Six hiking trails offer the opportunity to explore the prairie at any time and offer the potential to spot the bison herd. Guests can stop by the park's nature center before hitting the trails to find where they are most likely to spot the bison.

Stay Safe on the Trails

Prairie State Park has a multitude of opportunities to experience the sights, sounds



and wildlife of the tallgrass prairie, but it also requires park guests to follow certain safety precautions.

An important tip for safely viewing the bison is to stay at least 100 yards away.

"As you are near the bison, pay attention to their behavior. They will let you know if you are getting too close," said Miller. "If the bison raises its head and appears to be watching you closely, you may have gotten too close. And if it starts to raise its tail, it

(Top) The Path of the Sky People Trail at Prairie State Park is an excellent place to view bison.

(Above) Bison are best viewed at a safe distance of at least 100 yards.

DNR photos by Scott Myers
(top and above)



is getting even more anxious. The higher the tail, the more anxious the animal.”

For the safety of pets and guests, no pets are allowed on the trails. Visitors are welcome to bring their pets to the park’s campground and picnic area, but must follow the park system’s pet rules.

Experience the Prairie

Guests planning a visit to Prairie State Park are in for a great experience any time of year. From prairie grasses and wildflowers to majestic bison and elk, there is something for everyone.

The Regal Tallgrass Prairie Nature Center also is a great stop to learn more about the prairie ecosystem. The center includes lots of hands-on activities for children. The nature center also features a diorama depicting the prairie from spring to fall, as well as a bison exhibit.

The park has more than 25 rare and endangered plants and animals, many not found elsewhere in Missouri. There are approximately 500 species of plants and 150 species of birds, including northern harri-

(Above) As you encounter a bison, watch for changes in their behavior – these signs may indicate you are too close. DNR photo by Scott Myers

(Below) Bison calves stay close to their mothers when young, and their orange-colored fur helps hide them in tall prairie grass.



DNR photo by Tom Uhlenbrock



DNR photo by Scott Myers

ers, horned larks, Mississippi kites and a small population of greater prairie chickens, known as “boomers.”

Prairie State Park also includes a picnic area and a small campground for those who want to spend the night under the stars.

For more information about Prairie State

Park, or any other state park or historic site, visit mostateparks.com. Missouri State Parks is a division of the Missouri Department of Natural Resources. 🐾

Megan Hopkins was a summer intern with Missouri State Parks.

The Regal Tallgrass Prairie Nature Center features a diorama depicting the prairie and the animals you would encounter at the park.

The bison herd grazes as the sun sets at Prairie State Park. DNR photo by Scott Myers





“Whether you’re an educator, have kids or are an adult who likes cool rocks, dinosaurs, mastodons or maps, you will want to visit the Ed Clark Museum of Missouri Geology,” said Jeanie Strain, instructional technology specialist, Rolla Middle School.

Named for Edward L. Clark, State Geologist from 1944 to 1955, the museum aims to inspire curiosity through education by providing visitors an opportunity to examine geologic specimens and explore the geologic processes responsible for rocks, minerals, rivers and distinctive beauty and geologic history of Missouri.

Strain, who until last year was a science teacher at the school, partnered with the department’s Missouri Geological Survey for 10 years bringing approximately 325 fifth-grade students to the museum each year. Department staff help educate students during their end-of-school field trip known as “Rolla School Days.”



A Missouri Treasure

THE ED CLARK MUSEUM OF MISSOURI GEOLOGY

story and photographs by Hylan Beydler

(Top) Two members of Waynesville Cub Scout Pack 202 compare personal calcite samples to a huge specimen at the Ed Clark Museum of Missouri Geology. (Above left) Students ponder the Grunzel Mastodon tusk and bones – a major find from Holt County.

(Above right) MGS geologist Edie Starbuck helps interpret a fossiliferous rock with third- and fourth-grade students from Mark Twain Elementary School’s After School Science Club.

The focal point for the day is the museum and a time when students learn about geology, groundwater and environmental protection, and careers in earth science. During the students' half-day visit, staff members bring earth science to life by sharing their expertise through the use of short videos, hands-on activities and mini-courses geared to supplement classroom curriculum.

Strain said the middle school years are when students explore their interests. "Each year, we expose them to lots of different things. Students also learn about the importance of our state's natural resources and ways to protect them," Strain said.

"Many of the sessions are tied to our grade-level expectations. Students see and have real-life experiences that tie to our curriculum," Strain said. "Then we apply what they saw and learned to what we are studying in the classroom."

Strain and her colleagues appreciate the way staff coordinate and present information. Engaged students can better learn and plan for their future.

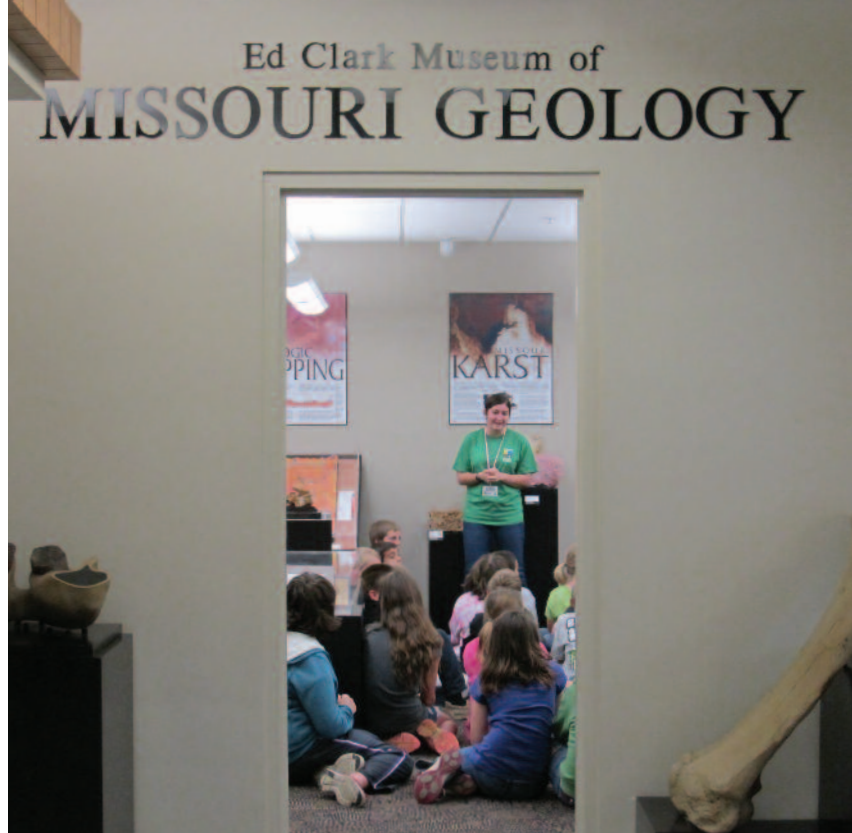
"Kids always talk about how fun the museum was and are surprised they actually get to touch things," said Rolla Middle School science teacher Bobbie Shelton. "They really enjoy seeing the Grundel Mastodon tusk. Visuals such as the demonstration using an apple to represent the earth and the small amount of the earth that is representative of usable water are things they remember – and take back with them."

"We truly appreciate the opportunity DNR provides our students," said Strain. "I sure will miss helping coordinate Rolla School Days and the wonderful staff who provide this exceptional experience for our students."

School-age children, college students, children of all ages, military groups, scholars, local residents and travelers from around the world visit the museum. A note placed in the museum comment box by Amber Redmon, a sixth-grade student in Mrs. Amber Hockersmith's class in St. James read, "I like your museum. It helped me be more interested in science in my town." Enrica Veneri, an exchange student from Parma, Italy, who attended Rolla High School wrote, "I enjoyed the museum. My dad and I look for fossils at home. I am so glad I found fossils in the museum's rock pile that I can take home to Italy!"

Among the museum collections are awards won by the Missouri Geological Survey at various World's Fairs, historic and current geologic maps, and tools of the trade. It also features information and displays about earthquakes, caves, oil, gas, mining and more.


The museum is located at the department's Missouri



(Above) Airin Haselwander, an MGS geologist, addresses Rolla fifth-grade students during Rolla School Days.

(Below) MGS geologist Peter Bachle explains methods for identifying rocks and minerals.



Geological Survey, 111 Fairgrounds Road, Rolla. Self-guided tours are available 8 a.m. to 5 p.m. weekdays. Admission is free. Learn more at dnr.mo.gov/geology/edclarkmuseum.htm. 



Hylan Beydler is division information officer for the Missouri Geological Survey, a division of the Missouri Department of Natural Resources.

EXPLORE HISTORY THROUGH HISTORIC SITE GARDENS

by Steph Deidrick



The heirloom garden at Watkins Woolen Mill State Historic Site contains flowers, herbs and vegetables that were common during the 19th century.

DNR photo by Michael Beckett

Vegetables, flowers and herbs are on display in gardens throughout spring and summer, but guests to several Missouri state historic sites can experience history while also admiring the plants in bloom. Gardens at three historic sites provide another facet to information available about the past.

Watkins Woolen Mill State Historic Site, Lawson

In the mid-1980s, staff at Watkins Woolen Mill State Historic Site established a garden on the property as part of the site's living history farm program. The site preserves and interprets many of the buildings of the Watkins families' 19th-century farm and mill operations. The heirloom garden focuses on several 19th-century varieties of vegetables and flowers.

"Visitors are welcome to walk through the garden year-round, but during the summer, when the living history program is active on weekends, visitors may see and speak with interpreters working in the garden," said Michael Beckett, site manager.

The layout of the heirloom garden is based, in part, on an illustration from the 1877 Atlas of Clay County, Mo. The illustration shows raised beds in the garden of a local farm, which is exactly what guests will find when exploring the garden.

"Gardens of the mid to late 19th-century period could have included raised rectangular beds, which were separated by walkways, along with larger plots and borders," said Beckett. "The garden borders usually contained a mixture of herbs, flowers and small fruits."

Along with the flowers and herbs being grown in the garden, guests will find an array of heirloom vegetables that were common in the 19th century, specifically varieties from the 1840s-1880s.

Deutschheim State Historic Site, Hermann

At Deutschheim State Historic Site, visitors can step back into German-American history. Hermann was an early Missouri settlement established in 1837. Guests at the site

can experience restored 1840s and 1850s buildings, and gardens on the property showcase the Old World with the gardening traditions of the time.

The traditional *gemüsegarten* of the period tended to be more focused on practicality rather than ornamentation, though flowers were typically intermixed right along with the cabbage, root vegetables, herbs and tomatoes.

The site's garden showcases heirloom plants in the traditional square plats, subdivided into equal sections. It's a technique that can still be found in Germany today.

"Our garden is really quite unique and many people no longer know of four-square gardening," said Cindy Browne, site administrator. "Of course, our German visitors do."

Deutschheim will host a special garden event June 6-7, held in conjunction with the Hermann Garden Club's annual garden tour. Guests have the opportunity to learn about 19th-century gardening techniques, heirloom plants and their uses during the early Missouri settlement period.



DNR photo by Ben Nickelson

(Above) The garden at Deutschheim State Historic Site is laid out in the traditional German four-square method.

(Below left) An interpreter in period dress works in the garden at Felix Valle House State Historic Site in Ste. Genevieve.



DNR photo by Donna Rausch

Felix Valle House State Historic Site, Ste. Genevieve

At Felix Valle House State Historic Site, the garden traces back to the Rozier family, who donated the house to Missouri State Parks in 1970. Through the years, staff have worked to convert the garden into an interpretive tool that exhibits the medicinal plants and herbs common in the 1830-40s. This is a good match for the house, which is furnished in the style of the 1830s. The site includes a host of artifacts that illustrate the American influence on the French community of Ste. Genevieve.

"There is nothing in the garden that could not have been there during the period we interpret," said Donna Rausch, site administrator.

The fenced gardens at the site offer a glimpse of a time when Missouri was part of a vast colonial empire in North America held by France and Spain. During a tour of the site, guests will hear about the foods commonly eaten by the historical residents of the home. In the garden, they can actually see how some of these vegetables and herbs were cultivated.

Each year, the house is part of the area's Master Gardener's Garden Walk. Guests can experience the sights, sounds and tastes of the garden with mint tea, lavender and lemon verbena cookies and a cold herbal soup, all using plants from the site's garden. Recipes are available for participants who want to recreate the tasty treats in their own homes.

For more information on these historic sites or to view upcoming events, visit mostateparks.com.

Steph Deidrick is division information officer for Missouri State Parks, a division of the Missouri Department of Natural Resources.

MissouriDNR Photo Contest Returns

Amateur photographers of all ages may enter the MissouriDNR Photo Contest to help showcase Missouri's rich natural and cultural resources. Winning photographs will be featured in the winter 2016 issue of *Missouri Resources*. The contest is divided into three categories:

Natural Resources: this category includes photographs of Missouri's air, landscapes and waterways.

Unique Places: submit your photographs taken within one of Missouri's 87 state parks and historic sites.

People Enjoying Missouri's Waterways: this category includes photographs of people enjoying Missouri's rivers, lakes and streams.

The contest runs March 1 through Aug. 1, 2015. Additional details regarding the contest are available on the department's website at dnr.mo.gov/photocontest. Good luck!

Rozier Gallery Features "Oil & Clay" Exhibit



The Missouri State Museum presents the work of artists Naomi S. Lear and Bo Bedillion in the exhibition, "Oil & Clay," at the Elizabeth Rozier Gallery in Jefferson City.

"Oil & Clay" begins the 2015 exhibition season at the Rozier Gallery. This particular exhibit is a joint showing of work, featuring pottery by Bo Bedillion and oil paintings by Naomi Sugino Lear. Both artists have exhibited work in mid-Missouri and nationally, and both are faculty at Columbia College. The exhibit will run through Saturday, April 25.

The Elizabeth Rozier Gallery is located inside the Union Hotel at Jefferson Landing State Historic Site, 101 Jefferson St. in Jefferson City. The gallery is open from 10 a.m. to 4 p.m., Tuesday through Saturday. Jefferson

Landing State Historic Site is operated by Missouri State Parks.

Mine Shaft Response Earns National Award

The Department of Natural Resources has been recognized for its quick response to a January 2013 mine shaft collapse that threatened two Springfield homes.

The U.S. Department of the Interior's Office of Surface Mining Reclamation and Enforcement awarded the department the 2014 Abandoned Mine Land Reclamation Award-Small Project Award for its response to the subsidence of soil into the Big Ben mine shaft. The subsidence threatened the foundations of two homes located near the opening.

The department dispatched environmental engineer Brent Willeford, environmental specialists Mike Mueller and Greg Snellen, and geologist Neil Elfrink to the site to assess

Time Exposures

The Cook Bros. Carriage Co. was created in 1897 when Missouri Bootheel natives Julius J. Cook, his brother Oscar H. Cook and two others, used the latest ideas about manufacturing to create a successful carriage business. Julius was 28 years old at the time. They began manufacturing spring wagons, buggies, road wagons, surreys and skeleton and phaeton carts in their four-story facility on N. Broadway Street in St. Louis. Work crews were assigned specific manufacturing tasks before the final product was built on an assembly line. The company had patents on special features, such as adjustable sun and storm hoods found in their 1899 catalog, and even offered a one-year guarantee. Replacements or repairs of wheels, springs and axles were made if they broke due to defective materials.

Shortly after Julius's death in 1903, Oscar and his sister-in-law, Sarah Stampfer Cook, continued to produce carriages, buggies, and even motor vehicles. This photo, titled "Five Workers in Cook Bros. Carriage Co. Workshop," features a well-dressed man in a bowler hat and four workers tasked with assembling and adding the horse shafts to the carriage. The image is part of a St. Louis Jewish Community Archives collection of deeds, catalogs, biographical information and albumen photographs. The collection depicts the crews and assembly line process of the Cook Bros. Carriage Co. and company founder Julius J. Cook. The collection is housed within the Saul Brodsky Library in St. Louis.



Send your photo to "Time Exposures," c/o Missouri Resources, PO Box 176, Jefferson City, MO 65102-0176. Original photos will be returned via insured mail. Pre-1980 environmental and natural resource photos from Missouri will be considered. Please try to include the date and location of the picture, a brief description and any related historic details that may be of interest to our readers.

the situation. Staff oversaw the stabilization of the two homes' foundations and the proper closing of the shaft.

OSMRE presented the award at the annual conference of the National Association of Abandoned Mine Land Programs in Columbus, Ohio, in September 2014.

The project was among those featured in OSMRE's award video that can be found at osmre.gov/programs/awards/AMLAwards.shtm. To read more about the mine collapse, visit dnr.mo.gov/magazine/docs/mr-winter-15.pdf#page=10.

Trout Season Under Way

A springtime ritual – the opening of trout fishing season – officially began March 1 at 6:30 a.m. at Bennett Spring State Park near Lebanon, Montauk State Park near Salem, and Roaring River State Park near Cassville.

Opening day of trout season is an important Missouri tradition, marking the beginning of a season that runs until Oct. 31. In addition to premier trout fishing, visitors to the state's trout parks can enjoy miles of hiking trails, lodging and camping options and on-site dining facilities.

Trout season in Missouri is a cooperative effort of Missouri State Parks, which manages state parks, and the Missouri Department of Conservation, which operates the hatcheries and stocks the streams with trout.



New Data in GeoSTRAT

Users of the Department of Natural Resources' GeoSTRAT tool will be pleased to know 17 new layers of data were added early this year. Layers include the following: computer-generated calculations relating to earthquakes in areas within close proximity to mines and sinkholes; soil liquefaction and landslide potential in the

event of an earthquake; temperature of rock formations in nine geologic formations in the state; locations of permitted oil and gas wells that are not protected under confidentiality rules; locations of regulated and non-regulated dams in Missouri; boundaries of Abandoned Mine Land projects in the state; names, locations and additional data for active Industrial Mineral Mines that are permitted to operate in Missouri; and Metallic Mineral Waste Management Areas that are permitted to operate in the state.

GeoSTRAT is a Web-based tool, built using Google Earth and ESRI GIS mapping technology. The ability to

overlay existing data on an aerial image in GeoSTRAT is made possible by data provided by the U.S. Department of Agriculture's National Agriculture Imagery Program.

To read more about and access GeoSTRAT, visit dnr.mo.gov/geology/geostrat.htm.

For news releases on the Web, visit dnr.mo.gov/newsrel.

For a complete listing of the department's upcoming meetings, hearings and events, visit the department's online calendar at dnr.mo.gov/calendar/search.do.

Looking for a job in natural resources? Go to dnr.mo.gov/hr.

OUR MISSOURI WATERS

Going Underground

When you think of a typical watershed, you tend to think of water on the surface such as rivers, streams and lakes. Folks in Perry County know that protecting their watershed means going underground. Perry County has more than 675 caves, the most in the state, and has the longest cave, Crevice Cave, at 28 miles in length. Perry County is also home to the grotto sculpin, a small, cave-dwelling fish found only in that county. The species was recently listed as endangered.

In a karst area such as Perry County, surface water can quickly enter the cave system through hundreds of sinkholes with little or no filtration, making these areas highly susceptible to non-point source pollution. Local citizens and leaders understand this area is rare and have brought in a wide range of partners to create the Perry County Karst Committee to draft a comprehensive watershed plan. The plan will protect the cave system through education and the integration of current and new environmental stewardship practices. The committee's goal is to protect and preserve the unique environmental features while allowing for sustainable growth and development.

Perry County's watershed protection is a great example of local folks taking a leading role in protecting all of our Missouri waters.



Sunlight illuminates the entrance to Perry County's Crevice Cave – the longest cave in Missouri.

Paul Hauck photo



Top Spots to Enjoy Ancient History



A trip to a state park brings plenty of opportunities to enjoy and explore the outdoors, but in Graham Cave, Washington and Thousand Hills state parks, guests also can learn about some of the state's earliest inhabitants.

Some of the state's earliest human history can be found at Graham Cave State Park. Graham Cave has a broad entrance measuring 120 feet wide and 16 feet high, making it a perfect shelter for ancient people. Excavations using radiocarbon dating determined that artifacts found in the lowest level of the cave went back nearly 10,000 years.

In comparison, the ancient rock carvings on display at Thousand Hills State Park may seem more recent, but archaeologists believe the area that is now the park dates back 1,500 years. Petroglyphs of crosses, arrows, snakes, thunderbirds and other animals, which were made by chipping and rubbing into the sandstone rock, can be found at the petroglyph site at the park.

The largest group of petroglyphs discovered in Missouri can be found at Washington State Park, which was once the location of prehistoric ceremonies associated with Mississippian Indian culture. The rock carvings remain as evidence of their beliefs, and give clues to understanding the lives of these people who are believed to have inhabited the area around A.D. 1,000.

Want to learn more about Missouri's earliest inhabitants? Other great trips include visits to Osage Village State Historic Site, which was once the location of an Osage Indian village; Illiniwek Village State Historic Site, the site of the only Illinois Indian village site found in Missouri; and Towosaghy State Historic Site, which was the site of a village and civil-ceremonial center for the Mississippian people.

(Top center) Because of the quantity and quality of the petroglyphs at Washington State Park, the sites were placed on the National Register of Historic Places. DNR photo by Scott Myers

(Above right) During Archeology Day at Graham Cave State Park, visitors have the opportunity to view ancient artifacts. DNR photo by Ben Nickelson

(Right) Visitors to Thousand Hills State Park can view the petroglyphs from a raised observation area. DNR photo by Scott Myers



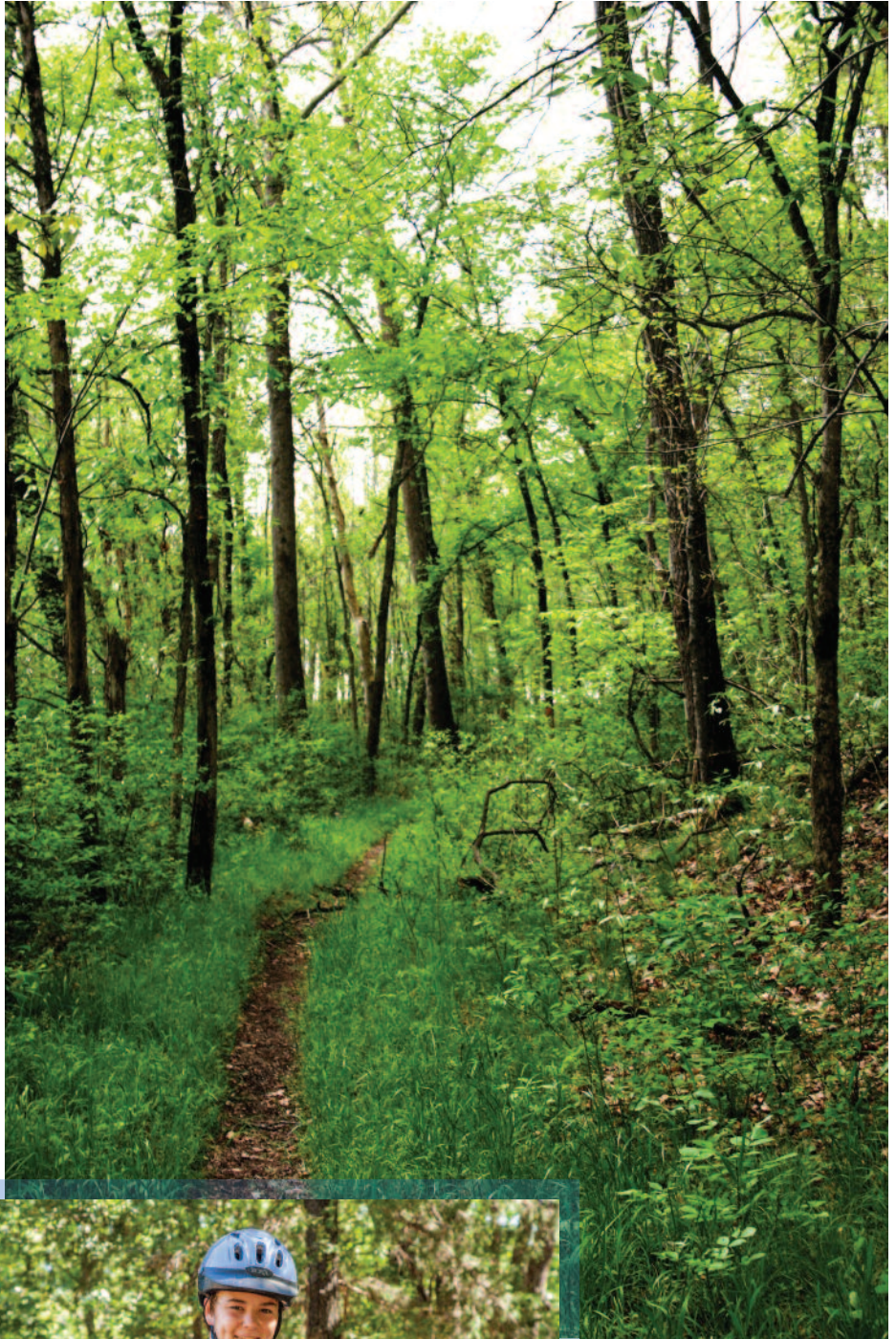
Trail of Four Winds

at Lake of the Ozarks State Park

At 13.5 miles, the Trail of Four Winds is the longest trail in Lake of the Ozarks State Park. The trail travels through almost every type of natural community at the park. This diversity provides stunning views of the lake, rock outcrops, breathtaking overlooks, seasonal streams, ponds and woodlands. Depending on the time of the year and the location, encounters with Cooper's hawks, white-tailed deer and fence lizards are not uncommon. Equestrian use, mountain biking and hiking are permitted on the trail.

The trail is divided into two sections with a north loop and a south loop; two connectors are available to make your hike longer or shorter. White connector 2 on the south loop is approximately 2.25 miles long. White Connector 3 on the North Loop is approximately .6 mile long. In addition there is a .3-mile spur on the south loop that leads to a breathtaking scenic overlook.

Having a trail map or topographic map is strongly suggested before using this trail.



DNR photo by Cindy Hall



DNR photo by Ben Nickelson

(Above) The Trail of Four Winds meanders through dense woodlands at Lake of the Ozarks State Park. (Left) In addition to mountain biking and hiking, horseback riding is a popular use of the trail.

Rock Matters



Sand

Sand is one of the most common materials on the earth's surface. Created by the weathering and breakdown of rocks into smaller particles of 0.1 to 2 mm in size, sand is composed of the mineral quartz, but other rock and mineral compositions are possible.

(Left) Sandstone / DNR photo by Mark Gordon
(Below) Chris Vierrether, DNR geologist, researches an interesting sandstone formation near the town of Gasconade. DNR photo by Mike Siemens

Sand is not just for beaches. It is widely used in construction, in horticulture, for water filtration and for many other purposes. Sand has been used on a local basis since before Missouri became a U.S. state and it continues to be used to enrich the modern way of life.

Sand and gravel (the two commodities are regularly tabulated together) used for construction purposes is an indicator of the overall health of the construction industry and an indicator of the state's overall economy. During the construction boon of the mid 2000s, Missouri produced nearly 17 million short tons of construction sand and gravel during the year 2006 – a record. In 2010, Missouri produced nearly 12 million short tons of construction sand and gravel valued at more than \$73 million.

Construction sand is primarily used for concrete aggregate, mortar, plastering, bricklaying, stone masonry, roofing gravel and paving. Economic deposits of construction sand and gravel mostly occur in the channels and floodplains of rivers and streams. Major producing basins in the state include the Missouri, Mississippi and Meramec rivers. Currently, 58 of 114 Missouri counties are active producers of construction sand and gravel.

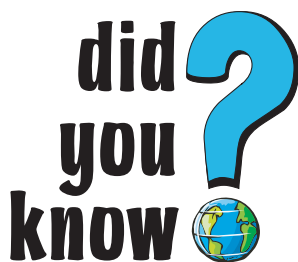
Sand used for industrial purposes has been produced in Missouri for over 140 years. More than 65 million short



tons of industrial sand, having an estimated present value of \$2 billion, have been mined in Missouri from the 1870s to present. Most industrial sand in Missouri comes from the St. Peter Sandstone, a sandstone deposit that is continuously present in the subsurface in the northern half and southeastern edge of the state. It occurs at the surface in a narrow band that begins in western Montgomery

County and runs southeastward along the Missouri River to just west of St. Louis. There, it continues south just west of the Mississippi River through Scott County. This sandstone has been used for glass manufacturing, polishing and grinding compounds, stone sawing and as blasting sand. It currently is being employed to enhance oil and gas extraction to increase the yield from wells.

A world without sand would be vastly different indeed. Sand filters exhaust particulates, it is an anti-caking agent in table salt, and is used in catalytic converters, white ware, earthenware, chinaware, glazed wall tile and sandpaper. Bricks made of clay mixed with sand are harder and bear greater weight than bricks made only of clay. Sand also is used for landscaping and many other purposes. Learn more about Missouri sand and other industrial minerals at dnr.mo.gov/geology/geosrv/imac/indminerals.htm.



Smells Like Rain

Did you know that the characteristic earthy smell of rain after a dry spell has a name? Petrichor (PET-rye-core) is a term that was coined by Australian researchers I.J. Bear and R.G. Thomas. Their research article titled, "Nature of Argillaceous Odour," was published in the March 1964 issue of *Nature* and describes how the smell originates from oil excreted by certain plants during dry periods. The oil is absorbed by clay-based soils and rocks along with another compound called geosmin, which is a metabolic by-product of certain Actinobacteria found in soil. The combination of the oils from the plants and geosmin create the distinctive scent called Petrichor.

In January 2015, researchers Cullen R. Buie and Youngsoo Joung used high-speed cameras to determine that when rain droplets hit a porous surface such as sandy soil, tiny droplets that carry particles dispersed in a gas are released into the air. These released droplets are known as aerosols. The porosity of the soil and the speed of the water droplets determine how much is released, with light rain releasing more than a fast, heavy downpour. It is believed these aerosol droplets are what carry the aromatic elements into the air. This phenomenon also could explain how certain bacteria and viruses stored in soil become airborne and spread.



Healthy Water

Contributes to a Healthy Economy



by Todd Sampsell
Deputy Department Director

Missouri is blessed with an abundance of water resources. Our rivers, springs, lakes and streams helped shape the history of our state and our country. Settlers from the east established St. Louis at the confluence of our mightiest rivers, the Missouri and Mississippi. From there, explorers and homesteaders spilled out into every corner of Missouri, and continued westward along our nation's waterways.

Today, Missouri's water resources support a vibrant economy and our citizens' health and lifestyles. The quality of our water is directly linked to our activities on the land.

Missouri's rivers, streams and lakes, along with underground aquifers, supply its 6 million residents with clean water to drink. Those same water resources support the state's \$9 billion agricultural industry, as well as

our cities, towns and other industries that employ Missourians. Healthy water resources also play a crucial role in supporting hunting, fishing, boating and other outdoor recreation, which comprise part of a \$12 billion outdoor economy fueled by Missouri's natural resources.

Missourians have a long, rich history of supporting conservation efforts and protecting our water resources. From Ozark springs and streams to our great rivers, we understand the connection between protecting our Missouri waters and protecting our Missouri way of life. New stresses to our water resources are a constant threat. Increasing development from sprawling urban and suburban centers, energy development needs, increased mining, the need for increased agricultural production to

feed a growing human population and a changing climate all threaten our water resources if we lack citizen engagement and proper planning.

The Department of Natural Resources will work cooperatively with all Missourians to protect our lands, improve our communities and ensure clean, abundant water for all generations. We will use key initiatives to work with farmers, landowners, rural communities and urban centers, small businesses to large industries, residents and partner organizations to protect our soil and waters, put projects on the ground today and plan for the future of our water resources.

Please join us by lending your voice to the planning and protection of Missouri's vast and precious water resources, visit dnr.mo.gov/omwi.htm.



Kansas City, Mo. provides a backdrop to the Missouri River at sunset.

DNR photo by Scott Myers

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2015 Katy Trail Ride

The 15th annual Katy Trail Ride, June 22-26, allows bicyclists to experience Katy Trail State Park from Clinton to St. Charles. The scenic five-day ride on the nation's longest developed rail trail is sponsored by Missouri State Parks and Missouri State Parks Foundation. For more information, visit katytrailstatepark.com.

